

REMARKS

The remainder of this Amendment is set forth under appropriate subheadings for the convenience of the Examiner.

Amendments to the Claims

Claim 1 has been amended to recite contacting heavy-metal-bearing particulate within particulate emissions after a heavy metal particulate capture unit with at least one complexing agent. Support for this amendment can be found in the specification, for example, on page 7, lines 19-20, page 10, lines 18-20, page 11, lines 2-5, and page 13, lines 10-14. Claim 1 has been further amended to more clearly define Applicant's invention, and to recite that the complexing agent does not include lime. To be consistent with the amendment to Claim 1, "calcium oxide" from Claim 2 and "calcium oxide" and "quicklime" from Claim 6 are deleted.

Claim 9 has been amended into a dependent form, and is now dependent from Claim 1. Claims 5 and 6 have been further amended to more clearly claim Applicant's invention. Claims 7 and 8 have been canceled.

New Claim 10 has been added, and recites that the complexing agent is added into the base of an air emission stack. Support for new Claim 10 can be found in the specification, for example, on page 7, lines 6-9 and page 10, line 8 through page 11, line 5.

The aspect of reducing the solubility and bioavailability of heavy metals within water-borne particulate emissions is rewritten as independent Claim 11. Support for this new Claim 11 can be found in the specification, for example, on page 8, lines 1-2, page 10, line 18 through page 11, line 5, and page 12, lines 16-17, and original Claim 1. Additional new Claims 12-17, dependent from new Claim 11, have been added. Support for new Claims 12-16 can be found in Claims 2-6, as originally filed. Support for new Claim 17 can be found in the specification, for example, on page 7, lines 6-9 and page 10, line 8 through page 11, line 5.

Rejection of Claims 1, 2 and 4-9 under 35 U.S.C. § 102(b)

Claims 1, 2 and 4-9 are rejected under 35 U.S.C. § 102(b) as being anticipated by US 5,284,636 to Goff, *et al.* (hereinafter “Goff, *et al.*”)

As amended, Applicant’s invention as described in independent Claim 1 is directed to a method of reducing the solubility and bioavailability of heavy metals within air-borne particulate emissions. The method comprises contacting heavy-metal-bearing particulate within *particulate emissions after a heavy metal particulate capture unit* with at least one complexing agent. That is, Applicant’s invention is directed to a post-emission particulate complexing method, i.e., treating heavy metal particles which are not captured by a heavy metal particulate capture unit.

As discussed in the specification on page 2, lines 6-16 and page 3, lines 17-19, small air-borne particles that pass through the capture unit are emitted into air through the stack. The emission particulate that is not captured by the capture unit still contains heavy metals that can leach into environment, including receptors such as humans, plants and animals. Applicant solved this problem by complexing heavy metals within particulate passed through a heavy metal particulate capture unit, thereby reducing the leaching of the heavy metals into environment. In addition, because Applicant’s invention treats uncollected particulate that is emitted out of a heavy metal particulate capture unit, Applicant’s invention deals with relatively small amounts of particles compared with bottom ash or fly ash that is captured and disposed of as waste. Thus, the solubility and bioavailability of heavy metals within the particulate emitted out of a heavy metal particulate capture unit can be reduced efficiently with a significantly small amount of complexing agent.

Goff, *et al.* disclose a process for stabilization of heavy metals *in ash* (e.g., bottom ash or fly ash) produced in a combustion system by introducing a phosphorus species into the system. In the process of Goff, *et al.*, a phosphorus species is introduced in the system *upstream of* particulate removal device 22 or *in particulate removal device 22* (see, for example, Column 3, lines 60-62). Thus, the treatment with a phosphorus species is performed on ash *before filtration* at particulate removal device 22, but *not* on particulate *emission after filtration*. There is no disclosure or suggestion in Goff, *et al.* of treating particulate within emissions after a heavy metal particulate capture unit with a complexing agent.

Therefore, the subject matter of currently-amended, independent Claim 1 is novel in view of Goff, *et al.* Claims 2, 4-6 and 9 depend from independent Claim 1, and thus these claims are also novel in view of Goff, *et al.* Claims 7 and 8 are canceled. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Rejection of Claim 3 under 35 U.S.C. § 103(a)

Claim 3 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Goff, *et al.* in view of US 5,245,114 to Forrester (hereinafter "Forrester").

Claim 3 is directed to the method of Claim 1, as currently amended, and further recites that the complexing agent includes alkali metal salts of phosphoric acid. Thus, the method of Claim 3 is directed to a post-emission particulate complexing method, i.e., treating heavy metal particles which are not captured by a heavy metal particulate capture unit.

As discussed above, there is no disclosure or suggestion in Goff, *et al.* of treating heavy-metal-bearing particulate within emissions after particulate removal device 22 with a phosphorus species. Rather, the process of Goff, *et al.* is designed to stabilize heavy metal particles in ash (e.g., bottom ash or fly ash) and to collect the stabilized heavy metal particles in particulate removal device 22. Thus, the teachings of Goff, *et al.* are limited to only a pre-emission particulate control. There is no disclosure or suggestion in Goff, *et al.* of treating any heavy metal particles emitted from particulate removal device 22, to reduce the solubility and bioavailability of the heavy metals from the particulate emission out of particulate removal device 22. Because the process of Goff, *et al.* is designed to collect the stabilized heavy metal particles, there is no reason for one skilled in the art to modify the process of Goff, *et al.* to introduce a phosphorus species after the particulate removal device.

In addition, Applicant's invention has an advantage over the process of Goff, *et al.* in that Applicant's invention is much more economic. The process of Goff, *et al.* is designed to treat ash itself, the amount of which can be, for example, hundreds tons, while Applicant's method is for treating particulate not captured by a particulate capture unit, the amount of which can be only, for example, a few pounds. Therefore, Applicant's method can reduce the solubility and

bioavailability of heavy metals from the particulate emission efficiently with a significantly smaller amount of complexing agent compared with that required for the process of Goff, *et al.*

Forrester discloses a method of immobilizing lead in bottom ash with a water-soluble phosphate. However, as with Goff, *et al.*, the teachings of Forrester are limited to only a pre-emission particulate control. There is no disclosure or suggestion in Forrester of treating any heavy metal particulate emitted from a heavy metal capture unit to reduce the solubility and bioavailability of heavy metal particulate emitted out of the capture unit. Thus, Forrester does not remedy the deficiencies of Goff, *et al.*

Therefore, the subject matter of Claim 3 is not obvious in view of Goff, *et al.* and Forrester, taken either separately or in combination. Reconsideration and withdrawal of this rejection are respectfully requested.

Subject Matter of New Claims 10-17 is Novel and Non-obvious in view of the Cited References

New Claim 10 is dependent from independent Claim 1, as currently amended. Therefore, for the reasons set forth above, the subject matter of new Claim 10 is novel and non-obvious in view of Goff, *et al.* and Forrester, taken either separately or in combination.

New Claims 11-17 are directed to a method of reducing the solubility and bioavailability of heavy metals within water-borne particulate emissions. The method of these claims comprises contacting particulate bearing a heavy metal, within particulate emissions after a heavy metal particulate capture unit, with at least one complexing agent.

First of all, neither Goff, *et al.* nor Forrester disclose or suggest a method of reducing the solubility and bioavailability of heavy metals within particulate emissions from *wastewater and water sources*. In addition, there is *no* disclosure or suggestion in either Goff, *et al.* or Forrester of treating heavy-metal-bearing particulate within particulate emissions *after* a heavy metal particulate capture unit to reduce the solubility and bioavailability of the heavy metal from the particulate emissions. Therefore, the subject matter of new Claims 11-17 is novel and non-obvious in view of Goff, *et al.* and Forrester, taken either separately or in combination.

Information Disclosure Statement

An Information Disclosure Statement (IDS) is being filed concurrently herewith. Entry of the IDS is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all pending claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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